NOAA Teacher at Sea
Tamil Maldonado
Onboard NOAA Ship FAIRWEATHER
July 18 - 28, 2005

Log 1

Friday July 15-Sunday July 17, 2005

NOAA Ship FAIRWEATHER:

Day: Sun July 17, 2005	Present Weather: PC	Sea wave height: -
Time: 8:00 p.m. (20:00)	Visibility: 10+	Swell wave height: -
Latitude: $57^0$43.6'N	Wind direction: 230	Sea water temperature: -
Longitude: $152^0$31.0'W	Wind speed: 2	Sea level pressure: 1017.0

I was supposed to fly on July 15 at 9:40 a.m. by United Airlines, going from San Juan, Puerto Rico to Chicago, then from Chicago to Anchorage, Alaska; and finally from Anchorage to Kodiak. All the same day.

Well… this is what really happened. I woke up at 5:00 a.m., traveled from Humacao to San Juan got in there at 7:30 a.m. , United Airlines attendant told me the flight got cancelled. They changed my Airline to American Airlines departing at 1:30 p.m., therefore I was not going to get to Kodiak that same day.

I checked my bags with American Airlines… sending them to Anchorage. My flight with American got delayed for two and a half hours; therefore I missed my flight from Chicago to Anchorage. I had to stay in Chicago one night with no bags, leaving to Anchorage the next day in the afternoon.

July 16 at noon I was back in O'Hare Airport in Chicago. My flight was again delayed for an hour. I got to Anchorage with no place to stay. My flight to Kodiak was going to be for the next day, July 17, in the afternoon. It was 2:30 a.m. in the morning and I still couldn't find a place to stay. Every hotel was packed, no place to go. Finally somebody cancelled their hotel reservation and I stayed at the Johnson Howard Hotel.

During this time I kept calling Elizabeth McMahon, the XO Lieutenant E.J. Van den Ameele, the hotel at Kodiak called the Buskin River Inn, and my family to let everybody know about my locations.

I got to Kodiak on July 17, 2005 at approximately 5:00 p.m. I e-mailed the XO and found a taxi to drive me to NOAA's boat. I came into the boat, they gave me some paperwork and forms (emergency information and NOAA Ship FAIRWEATHER visitor

orientation packet). I got to know few people on the boat: Abigail, Daniel, and Mark. Abigail showed me around the ship including my cabin room, the galley (kitchen), the different decks (floors), the lounge, computer labs, the bridge, etc.

I went to downtown Kodiak and got back to the hotel.

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Log 2

Monday July 18, 2005

NOAA Ship FAIRWEATHER:

Day: Mon July 18, 2005	Present Weather: PC	Sea wave height: 0
Time: 8:00 a.m.	Visibility: 10	Swell wave height: -
Latitude: $57^0$43.5'N	Wind direction: 260	Sea water temperature: -
Longitude: $152^0$31.0'W	Wind speed: 10	Sea level pressure: 1018.0

Today we did not get out of port. We were supposed to sail this morning, but there were a few problems we needed to take care of. First, the scientists' equipments did not come to the ship on time. Second there was a problem with the fuel pier.

I read the Standing Orders and saw a video about FAIRWEATHER Ship. Both helped me to understand some rules, daily duties, safety information, and hierarchy of people and their positions in the ship. For example, the highest position in the ship is called Commanding Officer (CO), then we have the Executive Officer (XO), Officer of the Deck (OOD) and Officer In Charge (OIC).

I also learned some concepts that are well used in the ship. Some of these concepts are brow, galley , bridge, fantail, etc.

I got to know people in the ship and scientists that were part of ECO- FOCI research. ECO-FOCI stands for Ecosystem and Fisheries- Oceanography Coordinated Investigation. It is the first time these scientists are on FAIRWEATHER ship since the boat it is mostly used for Hydrographic work.

After the scientists got their equipment (sent from Seattle), they installed machinery, nets, and computers. It took a long time to do this.

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Log 3

Tuesday July 19, 2005

NOAA Ship FAIRWEATHER:

Day: Tue July 19, 2005	Present Weather: PC	Sea wave height: 0
Time: 8:00 a.m.	Visibility: 10	Swell wave height: -
Latitude: $57^0$43.5'N	Wind direction: Light	Sea water temperature: -
Longitude: $152^0$31.0'W	Wind speed: Airs	Sea level pressure: 1017.3

Day: Tue July 19, 2005	Present Weather: CL	Sea wave height: <1
Time: 8:00 p.m. (20:00)	Visibility: 10	Swell wave height: -
Latitude: $57^0$46.8'N	Wind direction: 115 (True)	Sea water temp: 12.1^0C
Longitude: $152^0$03.0'W	Wind speed: 4 knts	Sea level press: 1015.9 mb

We took off from port at 10:00 a.m., after dealing with some ship problems. An hour after we started testing all research equipment and noticed there was a problem with the coaxial cable that connects nets with computer interface. The Electrical Technician worked with that issue for hours. Everything else was fine. This coaxial cable and getting data information to computers was really important to get research correctly. They should be able to know depth, temperature, salinity, pressure and chlorophyll information through the net's path in water, main keys for their oceanographic research.

At night I interviewed Chief Scientist Janet T. Duffy-Anderson and other participating scientists (Colleen E. Harpold, Matthew T. Wilson, Miriam J. Doyle, Sigrid A. Salo, Dylan Righi, David G. Kachel and William J. Floering). We discussed cruise objectives and operations. FOCI will conduct an ichthyoplankton survey in the Gulf of Alaska in the vicinity of Kodiak Island, Alaska. This area is a known nursery ground for a variety of species of fish - walleye Pollock, Pacific cod, rock sole, Pacific halibut. Work is needed to describe larval fish and zooplankton assemblages in summer, and to examine the movement of water and associated biota from the slope to the shelf. Six satellite-tracked drifters will be released to study current trajectories in the vicinity of Port Lock Bank. Conductivity, Temperature, and Depth profiler casts will be made to characterize

water column properties, collect nutrient and chlorophyll information, and to evaluate the flow field.

A goal of the Eco-FOCI is to identify the physical and biological factors that underlie ecosystem change, and to understand how those factors interact. One focus is the effects of perturbation at lower trophic levels; therefore they will collect ichthyoplankton using a 1 m2 Tucker net and collect juvenile and small fishes using a Method net. And Sea-Bird Electronics SBE 911plus Conductivity, Temperature and Depth (CTD) casts will collect physical data as well as water samples for nutrients and chlorophyll.

Scientific Computer System shall operate throughout the cruise, acquiring and logging data from navigation, meteorological, oceanographic, and fisheries sensors.

I recorded their first test and learned how to throw the nets, how to get them back, etc. In that way I was going to be able to do it myself for the next stations.

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Log 4

Wednesday July 20, 2005.

NOAA Ship FAIRWEATHER:

Day: Tue July 20, 2005	Present Weather: PC	Sea wave height: 2
Time: 8:00 a.m.	Visibility: 10	Swell wave height: 330
Latitude: $58^0$52.7'N	Wind direction: 290	Sea water temperature:13.7
Longitude: $151^0$10.6'W	Wind speed: 17 knts	Sea level pressure: 1015.9

The Tucker trawl and Method Net had been deployed all night and day. Scientists have shifts of 12 hours every day. Equipment is attached in the fantail area (back of ship). There was a problem with the coaxial cable… it was broken, wet and they had to cut a portion of it. The Electrical Technician needed to set up the cables, put them together, and use a cable coating so the wires would not get wet again. Still, the data was not going through the wires into the computer data base. After a few hours they had some data and started doing experiments with the CTD and Tucker net. I was washing bottles they use to recollect larvae, taking them to the lab, freezing the bottles and chlorophyll filters, writing data down on their sheets, etc. It was very exciting to see larvae, jelly fish, and little fish.

I also went to the bridge and we started talking about the mathematics behind navigation, including all the geometry, trigonometry and vectors involved. We used the charts (maps) to find out our position, calculate how much time it would take for us to get to the next station where we were going to do another survey on larval fish. I also got to know all instruments on the bridge, and how they use them for traveling, and navigation. Moreover, we calculated true speed looking at the relative speed and using instruments, vector, ship speed, and charts.

At the end of the day I read the Draft of the scientific research, which helped me to know more information about their equipment and specifications of nets, CTD, and computer interface, among others.

I also talked to some students that are doing their internship with NOAA vessels. It was great to get to know them, and see their different interests on the ship.

Tomorrow I am going to interview people from the Hydrographic lab department, and learn some more about navigation.

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Log 5

Thursday July 21 ,2005

NOAA Ship FAIRWEATHER:

Day: Wed July 21, 2005	Present Weather: PC	Sea wave height: -
Time: 8:00 a.m.	Visibility: 10	Swell wave height: -
Latitude: $58^0$03.6'N	Wind direction: 340	Sea water temperature:13.9
Longitude: $150^0$33.6'W	Wind speed: 4 knts	Sea level pressure: 1018.2

Navigation…
Today we studied latitude and longitude and their relation to each other. We used geometry concepts like degrees, parallel lines, circles, transversal lines, alternate internal angles, and alternate external angles. We used charts, grids, compasses, and different instruments from the bridge. We shared information about how people were measuring latitude and longitude in olden days and how it is measured nowadays. We discussed mathematical relations of degrees, minutes, seconds and nanomiles. One question for you… how are the Sun and angles utilized in calculating latitude and longitude?

Hydrography Lab…
I got the chance to look at some hydrographic data, and to get to know information about the different sonars they are using to retrieve all the data. The Difference among sonars is the beams per particular time that sonars are shooting. FAIRWEATHER ship has a sonar that does 160 beams in 220 microseconds. They also use little boats to go to shallower grounds and have sonars of 111 beams and 101 beams per 220 microseconds. They get a huge amount of data coming into their computer devices, and then they use software called Cares Hips and Sips, which recollects all the data plotting it in two dimensional and three dimensional grids. It also used colors to identify how deep it is in that particular region. Blue is used for deeper regions, while red is used for shallower regions. There are a few issues that needed to be corrected. There is some noise in the data due to salinity, movement of vessel, and tides. An important key is that they need corrections on real time. To correct this data, they use another instrument like POSMV. After all data is collected they could go back and get pictures per zone, and per beam too. Therefore they could analyze all data and get correct information. They also use satellites called GPS - Global Positioning System. In the future I will be talking to Richard (the ET- Electrical Technician) about all satellites they are using on board.

FOCI…

They had some problems today too with the computer system, so in order to know about the depth of the net in the seawater they have to calculate "by hand" using charts. For an approximately 45 degree angle measured between the cord holding the net and perpendicular to the floor of the ship, you need how much wire is out, how wide the circle is that holds the wire, how many revolutions, and if there is a linear relationship between this information and the desired net depth. For example if you want the net 40 meters deep vertically then you need 57 m wire out. Remember that the boat keeps moving at certain time and that will give you an angle (in this case you need the angle to be approximately 45 degrees). Scientists use available charts for this information, but we can actually calculate it manually.

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Log 6

Friday July 22, 2005

NOAA Ship FAIRWEATHER:

Day: Fri July 22, 2005	Present Weather: PC	Sea wave height: 1-2
Time: 8:00 a.m.	Visibility: 10+	Swell wave height: 2
Latitude: $58^0$07.4'N	Wind direction: 136	Sea water temperature:13.2
Longitude: $151^0$21.4'W	Wind speed: 7 knts	Sea level pressure: 1018.9

FOCI…
Today I have been working hand in hand with scientists, throwing nets, collecting depth, pressure, temperature, and chlorophyll data. We have also been washing nets, getting survey of larvae, writing it down in sheets database, labeling, freezing larvae and chlorophyll samples. We analyze some graphs we were getting from the experiments.

Here are some questions I have… how is global warmth is affecting ecosystems? How do fish overcome these changes? Do they go up or down in the ocean columns? Are they changing their nursery places? How is their behavior in comparison to other years? Which parameters affect them most: salinity or temperature? Some of these questions are being answered by the scientists, and others are still unanswered for which we are trying to find the answers. It seems that Alaskan fish can adapt easily to salinity changes. Remember that glaciers are melting more continuously than before and fresh water (since it is less dense than seawater) stays in the surface, which means there is a change in salinity and temperature in the ocean. Therefore there could be changes in fish behavior and in their ecosystem. It seems the larvae and fish will be affected by temperatures. They could be moving from ocean columns to get to the right temperature. But they also need food like plankton that maybe stays at a different column of seawater. That will be a survival problem.

Scientists are focusing their work on commercial fish such as Pollock and Pacific Halibut. It is the first time they have done this survey during summer. They want to have a template for next year to compare data with. Later we could do some statistical models, and mathematical models to compare in terms of years or data columns.

Navigation…
This afternoon I as actually sailing the boat… I had the power on my hands. I needed to

be really focused and follow instructions at all times. We also calculated times for some positions, stations where we were going to do survey. I also calculated True Speed, which depends on relative speed, wind speed, angles and locations of the boat.

I had the chance to see whales, little fish and a jelly fish of the size of my 4 fingers.

I also did some hydrographic studies of the region, got some data, pictures and depths of the ocean.

We had problems with the coaxial cable again and I got some other information about sonars that I started to read. I even worked out today!

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Log 7

Saturday July 23 2005

NOAA Ship FAIRWEATHER:

Day: Sat July 23, 2005	Present Weather: F/L	Sea wave height: 2
Time: 8:00 a.m.	Visibility: 5	Swell wave height: 0
Latitude: $57^0$23.7'N	Wind direction: 180	Sea water temp: 14.0
Longitude: $151^0$21.5'W	Wind speed: 10 knots	Sea level press: 1017.1

Today I interviewed the Electrical Technician about satellites on the ship, server computers, connections among rooms, computer labs, processes of e-mails, phone communications, and digital vs. analog communication. He showed and explained all equipment they have in the computer rooms, how systems talk to each other, how the e-mail codes and compresses data, and how they are stored in lines and by priorities. He also showed me how they keep information in different places in the boat in case there is a fire in regions where they have the servers. Moreover, he explained the different satellites and which ones are being used all the time for navigation. It was really interesting to see all the systems working together.

I studied more about sonars and how they actually work undersea. I read about the sonar setup, vessel operation, data analysis, and how noise is reduced on these sonars by the speed of the ship. For example, in a SeaBat 8160 sonar the best vessel speed while doing the survey is at 10 knots. There are exciting papers of Noise Analysis explaining the type of sonars they use.

At the end of the day I did some laundry and saved pictures on disks.

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Log 8

Sunday July 24 2005

NOAA Ship FAIRWEATHER:

Day: Sun July 24, 2005	Present Weather: CL/L	Sea wave height: 2
Time: 8:00 a.m.	Visibility: 9	Swell wave height: 3-4ft
Latitude: $56^0$47.9'N	Wind direction: 147	Sea water temp: 14.0
Longitude: $152^0$24.0'W	Wind speed: 9 knts	Sea level press: 1015.0

I started today on a night shift. I got up at 2:00 a.m. and worked with scientists that were doing a 24:00 - 12:00 (noon) shift. We used the bongo and tucker nets, plus the CTD to collect samples of water. The CTD has 11 fiver-liter spaces that are opened electronically in different sea columns. This gives a good idea of what is going on in terms of salinity, temperature, pressure, and food for fish throughout the ocean (vertically). The other nets just take surveys as a hole or by only two regions of columns.

At 5:00 a.m. I stayed on the bridge and on watch till 7:00 a.m. and tried to make the boat steady. After breakfast I went to sleep. After lunch I went to the engineering department and learned about engines, and how the boat actually works. Some of the engines work with oil, some with seawater, and other ones with fresh water. It was incredible for me to see all the machinery behind a boat's work. The engineer explained about the maintenance and equipment. We also went to the refrigeration room to see how the system works with compression and condensation, how AC gets to our rooms, and how the boats use all the engines for energy, movement, and stability.

The sea weather today was awful—big waves coming in during afternoon and at night. Many people got seasick today.

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Log 9

Monday July 25 2005

NOAA Ship FAIRWEATHER:

Day: Mon July 25, 2005	Present Weather: CL/F	Sea wave height: 1
Time: 8:00 a.m.	Visibility: 8	Swell wave height: 4-5ft
Latitude: $56^0$54.2'N	Wind direction: 160	Sea water temp: 13.8
Longitude: $153^0$22.1'W	Wind speed: 16 knts	Sea level press: 1007.5

Day: Mon July 25, 2005	Present Weather: CL	Sea wave height: 3
Time: 8:00 p.m. (20:00)	Visibility: 8	Swell wave height: 6-7ft
Latitude: $56^0$06.7'N	Wind direction: 193	Sea water temp: 14.0
Longitude: $153^0$17.3'W	Wind speed: 15 knts	Sea level press: 1009.0

We sailed through Sitkalidok Strait, southeast of Aliulik, Kodiak Island. I got up seasick at 1:30 a.m. and stayed awake till 4:30 in the morning. I went back to sleep and after lunch I took a seasick pill to feel better. It just made me sleepy.

In the afternoon I interviewed one of the student scientists, Dylan Righi. He is a programmer and his work deals with wavelets using drifters to recollect data. He also "cleans" the data, since there is always some noise to be corrected. He graphs the path of different types of drifters into the water and does some numerical analysis. He runs a FORTRAN code on a UNIX system parallel to a computer back in Seattle. His data analyses are from the North East Pacific regions. The resolution of the wavelets is approximately 9 km, 520 points. Anyone interested on the code or data could get it from FOCI website: http:// www.pmelnoaa.gov/foci/

Sick 1:30 a.m.gt
Sleep
Talked with a programmer scientist- wavelets

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Log 10

Tuesday July 26, 2005

Day: Tue July 26, 2005	Present Weather: CL/F	Sea wave height: 2
Time: 8:00 a.m.	Visibility: 8	Swell wave height: 5-7ft
Latitude: $56^0$54.2'N	Wind direction: 160	Sea water temp: 12.7
Longitude: $153^0$22.1'W	Wind speed: 16 knts	Sea level press: 1007.8

We are underway in the Gulf of Alaska, Southeast of Sitkinak Island. This is our last day of doing FOCI survey. We used the Bongo Tow and CTD throughout day.

At 5:00 p.m. we were done with survey and transiting to Dutch Harbor, AK

At night I interviewed Chief Scientist, Janet Duffy-Anderson, one more time. We talked about how to know fish ages and how fast they are growing. It is because of their rings—the number of rings a larvae has will give the days they are alive. Also, you can know their age by how far apart those rings are, which gives you the information of how fast they are growing.

Furthermore we talked about atmospheric changes and how this is affecting the ecosystem. The target of FOCI is to get biological as well as physical data on the changes in the ocean and how those changes interact with the biota. They wanted to do this research in Alaska because you can see changes more rapidly at the poles of the planet. We have seen phenomena like El Nino, La Nina and others increasing in frequency and duration. The rate between phenomena is increasing—they are happening more frequently for the last decade.

I will be able to get fisheries raw data in time series done by FOCI and will continue doing some research back home in this area.

At night we did an acoustic hydrographic survey, and by changing depth target we got different data, all related. Changing the depth target changes how deep the beams go through the water and come back. We worked with Hips & Sips Computer Software. This program also corrects in real time the error estimates for each contributing sensor. These entries are necessary for the computation of the Total Propagated Error. The Vessel Configuration File (VCF) contains information about the different sensors installed on the survey vessel and their relationship to each other. The information in the file is applied to logged, converted data files, and when the final sounding positions are

calculated, the data is merged. The entries in the VCF are time tagged and multiple time tags can be defined for each sensor. This allows the user to update sensor information during the course of a survey. This may occur if a piece of equipment has been moved.

In order to define the new fields in the VCF it is essential to understand standard deviation. The standard deviation is a statistic that explains how tightly various examples are clustered around the mean in a set of data. When the data is tightly bunched together the bell-shaped curve is steep and the standard deviation is small. When the data is spread apart, the bell curve is relatively flat indicating a larger standard deviation.

The vessel information will be displayed in the Vessel Editor. The sensor positions are represented by colored dots. The VCF can be updated if a sensor changes position, and a unique time stamp ensures that the correct offsets are applied to data recorded at a certain time. Each time the sensor information is changed, the drop down list above the 3-D vessel model will be updated to include the new time stamps. The data grid below the 3-D vessel contains all the offset information for the vessel.

Tomorrow… we will talk about the stability of the ship, and how its is done (so we do not sink!).

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Log 11

Thursday July 27, 2005

NOAA Ship FAIRWEATHER:

Day: Thu July 27, 2005	Present Weather: PC	Sea wave height: 0
Time: 8:00 a.m.	Visibility: 10+	Swell wave height: 1
Latitude: $55^0$32.7'N	Wind direction: 320	Sea water temperature:13.4
Longitude: $159^0$18.8'W	Wind speed: 7 knts	Sea level pressure: 1013.6

During the day I talked with the captain about boat stability. Stability is defined as the ability of a vessel to return to its original condition or position after it has been disturbed by an outside force. Anyone who has been at sea and felt the vessel roll, for example, and then right itself (only to roll in the opposite direction and right itself again) has seen stability in action.

Outside forces include wind seas, adding/removing weight, and free surface. The six Motions of a Vessel in waves are rolling, pitching, yawing, heaving, swaying, and surging. Rolling is the motion about the vessel's longitudinal axis. Pitching is the motion about the vessel's transverse axis. Yawing is the motion about the vessel's vertical axis. Heaving is the vertical bodily motion of the vessel (whole vessel moves up and down together). Swaying is lateral (side to side) bodily motion. Surging is the longitudinal (fore and aft) bodily motion. All or most of the motions can occur simultaneously and have their effect on the efficient operation of a vessel. While the ship's officer cannot completely control these motions, there is much that can be done to diminish or alleviate their effects.

Motions of the Vessel and Governing Stabilities include: Roll- Transverse Stability, Pitch- Longitudinal Stability, Yaw- Directional Stability, Heave - Positional Motion Stability, Surge - Stability in motion Ahead or Astern, Sway - Lateral Motion Stability. The way a vessel rolls is a direct indication of her stability.

The condition of a vessel is determined almost solely by the location of two points: the Center of Gravity (G) and the Center of Buoyancy (B). G is the point at which all vertically downward forces of the vessel can be considered to act. In other words, the ship will behave as though all of its weight were acting downward through this point. B is the point at which all the vertically upward forces of support (buoyancy) can be

considered to act, or, the center of volume of the underwater portion of the vessel. In other words, the ship will behave as if all of its support is acting up through this point. There are a lot of mathematical concepts and processes to compute stability. Theory of Moments, Inclining formula, Trigonometry, Change in Mean Draft are also implied in vessel stability.

During the afternoon I worked on the computer, and I put all my pictures on the FAIRWEATHER's computer network.

We also had the drills: 1) Men on Board, 2) Abandon Ship, and 3) Fire and Emergency.